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July 29, 1999

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
The Portals
445 12th St. SW
Washington, D.C. 20554

Re: CC Docket No. 98-137/and ASD Docket No. 98-91

Dear Ms. Salas:

On July 28, 1999 Dr. Larry Vanston of Technology Futures Inc., Anthony Alessi of Ameritech, Gerald Asch of Bell Atlantic, Scott Randolph of GTE, Liz Geddes of SBC, William Johnston of US West, and I, representing BellSouth made a presentation to FCC staff in which Dr. Vanston described the forward looking economic models of technology forecasting the large ILECs use to set depreciation lives for their external financial reports, which are governed by and must comply with generally accepted accounting principles (GAAP). FCC staff attending some or all of that presentation included: William Bailey; Linda Kinney; Lisa Zaina; Deena Shetler; Don Stockdale; Peyton Wynns; John Berresford; Patrick DeGraba; Staci Pies; Kent Nilsson; and Jerry Stanshine. The attached written material formed the basis for the presentation.

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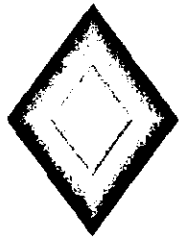
As required by Section 1.1206(b) (2) of the Commission's rules, I am filing two copies of this notice in CC Docket No. 98-137 and ASD 98-81 and ask that you associate this notification with the record in each of those proceedings.

Sincerely,

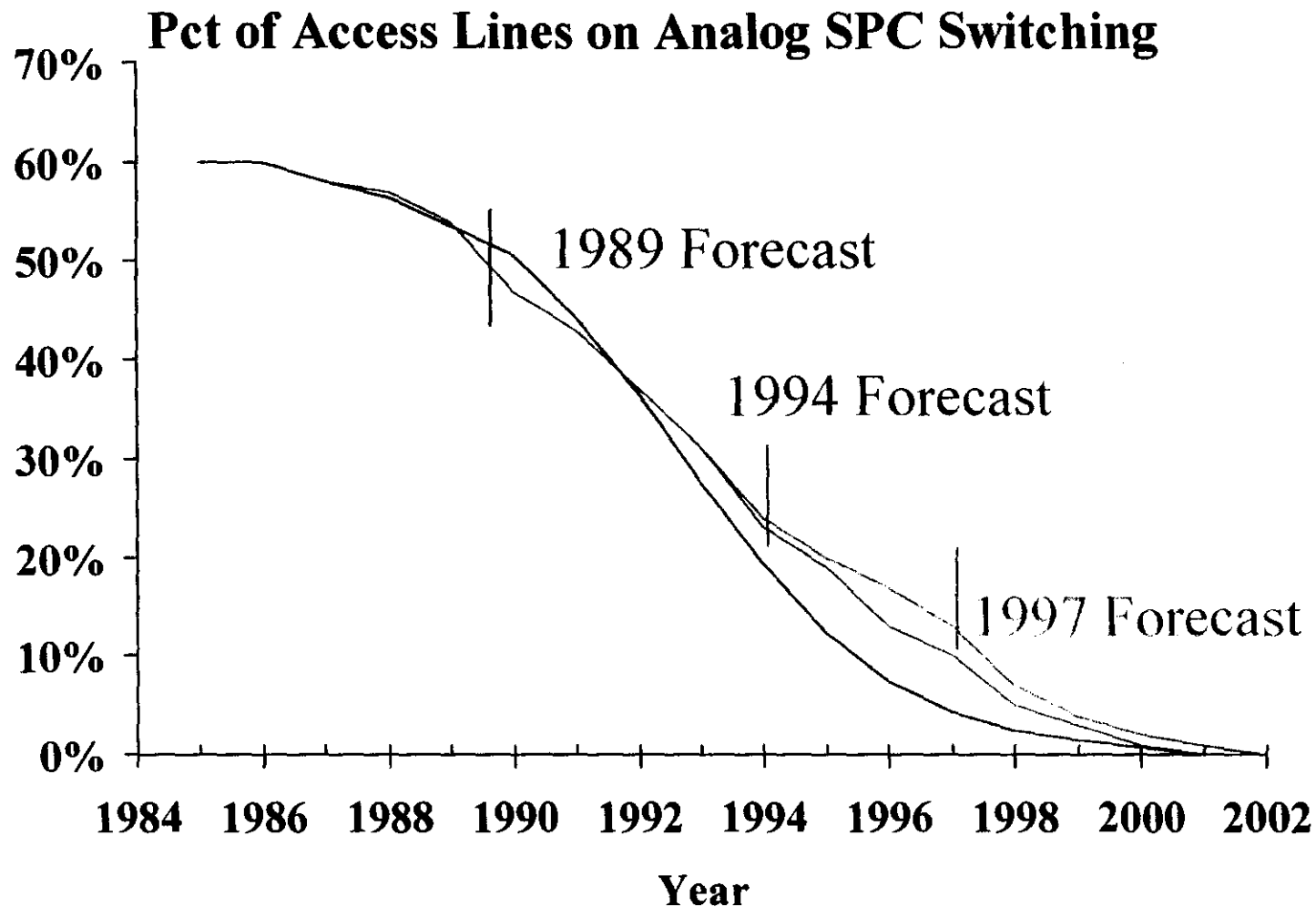
A handwritten signature in black ink that reads "Kathleen B. Levitz". The signature is written in a cursive, flowing style.

Kathleen B. Levitz
Vice President – Federal Regulatory

cc: William Bailey (w/o attachment)
John Berresford (w/o attachment)
Linda Kinney (w/o attachment)
Patrick DeGraba (w/o attachment)
Kent Nilsson (w/o attachment)
Staci Pies (w/o attachment)
Jerry Stanshine (w/o attachment)
Deena Shetler (w/o attachment)
Donald Stockdale (w/o attachment)
Peyton Wynns (w/o attachment)
Lisa Zaina (w/o attachment)
Dorothy Atwood
Sarah Whitesell
Kyle Dixon



Example of Past Experience



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Sample Track Record

| Year/ Technology | TFI Forecast Then | Situation Then | Common Wisdom Then | Situation Now |
|------------------------------------|--|---|---|---|
| 1986 Local Digital Switching | All local digital switching by 1997-2001 | 11% Digital, 60% Analog ESS & Growing | Few Analog ESS Retirements Before 2000 | 87% Digital; 100% by 2001 |
| 1987 Cellular Prices | Cellular total monthly cost (250 mins) down to \$40-60 by 1997 | Total monthly cost: \$145 | Cellular inherently expensive | \$30 Monthly for 250 min. plans common |
| 1987 Wireless vs. Wireline | Wireless will compete with wireline by the late 1990s | Wireless subscribers under 1 million | Wireless is strictly a complement to wireline | Wireless companies are targeting wireline |
| 1988 Digital Loop Carrier | 15% of access lines on fiber Digital Loop Carrier (DLC) by 1996 | 1% of access lines on fiber DLC | DLC only useful for long loops (<10% of access lines) | 15% of access lines on fiber DLC in 1997 |
| 1989 SONET | 40% of LEC fiber circuits on SONET in 1997 | SONET in technical field tests | SONET promising but unknown | 40% of LEC fiber circuits on SONET 1997 |
| 1990 Digital Comm. Services | Mass market for digital communication services will develop in 1990s | Severe problems rolling out ISDN | No need for digital; analog modems okay for mass market | High interest in xDSL and Cable Modems rollouts |
| 1991 Electronic Image | Most computer-based images sent electron- ically by 2000 | Most images sent by hard copy, disk- ette or tape, or fax | Varied | Internet/WANs handle wide variety of imaging |
| 1992 Online Households | 17% of US households will be online by 1997 | Less than 1% of HHs online services | Videotex/Online Services "dead on arrival" | 20% of all HHs online in 1997 |



Technology Forecasting Approach to Economic Lives

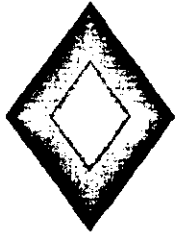
Washington, D.C.
July 28, 1999

Larry Vanston
President

Technology Futures, Inc.
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Austin, Texas 78750-1859 U.S.A.
Telephone: (512) 258-8898
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Overview

- Technology Forecasting
- Depreciation Lives and Technology Change
- TFI Forecast

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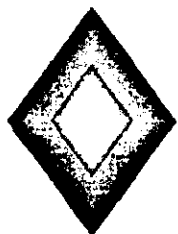
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Technology forecasting is the process of using logical, reproducible methods to project, in a quantified manner, the intersection of market needs with new technical capabilities at selected times in the future.

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Technology Strategic Analysis

Future Related Issue
(Business Problem/Opportunity)

Ways Future is Viewed

Extrapolators

- Technology Trend Analysis
- Fisher-Pry Analysis
- Gompertz Analysis
- Growth Limit Analysis
- Learning Curve

Pattern Analysts

- Analogy Analysis
- Precursor Trend Analysis
- Morphological Matrices
- Feedback Models

Goal Analysts

- Impact Analysis
- Content Analysis
- Stakeholders' Analysis
- Patent Analysis

Counter Punchers

- Scanning, Monitoring, Tracking
- Alternate Scenarios
- Cross Impact Analysis

Intuitors

- Delphi Surveys
- Nominal Group Conferencing
- Structured & Unstructured Interviews
- Technology Advantage Management

Quantitative

Qualitative

Forecasts
(Conclusions)

Process
Transfer

New Products

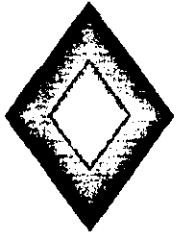
New Markets

Strategic
Planning

Financial

Others

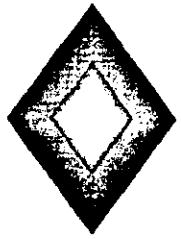
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Forecasting the Adoption of New Technologies

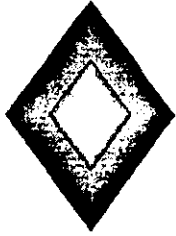
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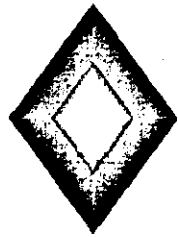


What are the Drivers of Technology Adoption?

- Old equipment wears out and is then replaced by new (Mortality)
- Early adopters teach and lead followers (Diffusion)
- Older equipment is forced out by the superior performance of newer technology (Substitution)

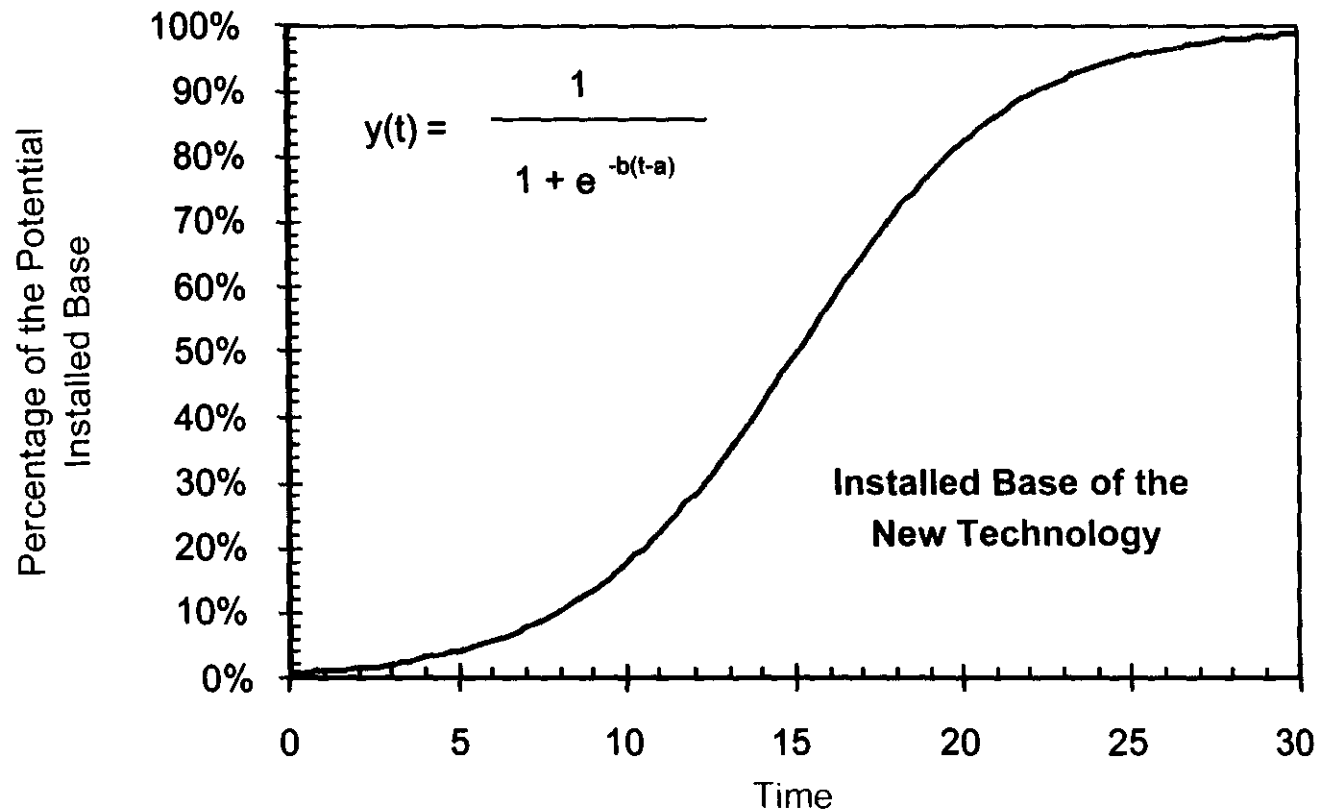


When substitution is driven by superior technology, use the Fisher-Pry model. The new product or service must present some technological advantage over the old one.



Fisher-Pry Substitution Pattern

S-Shaped Curve (General Shape of Substitution Model)

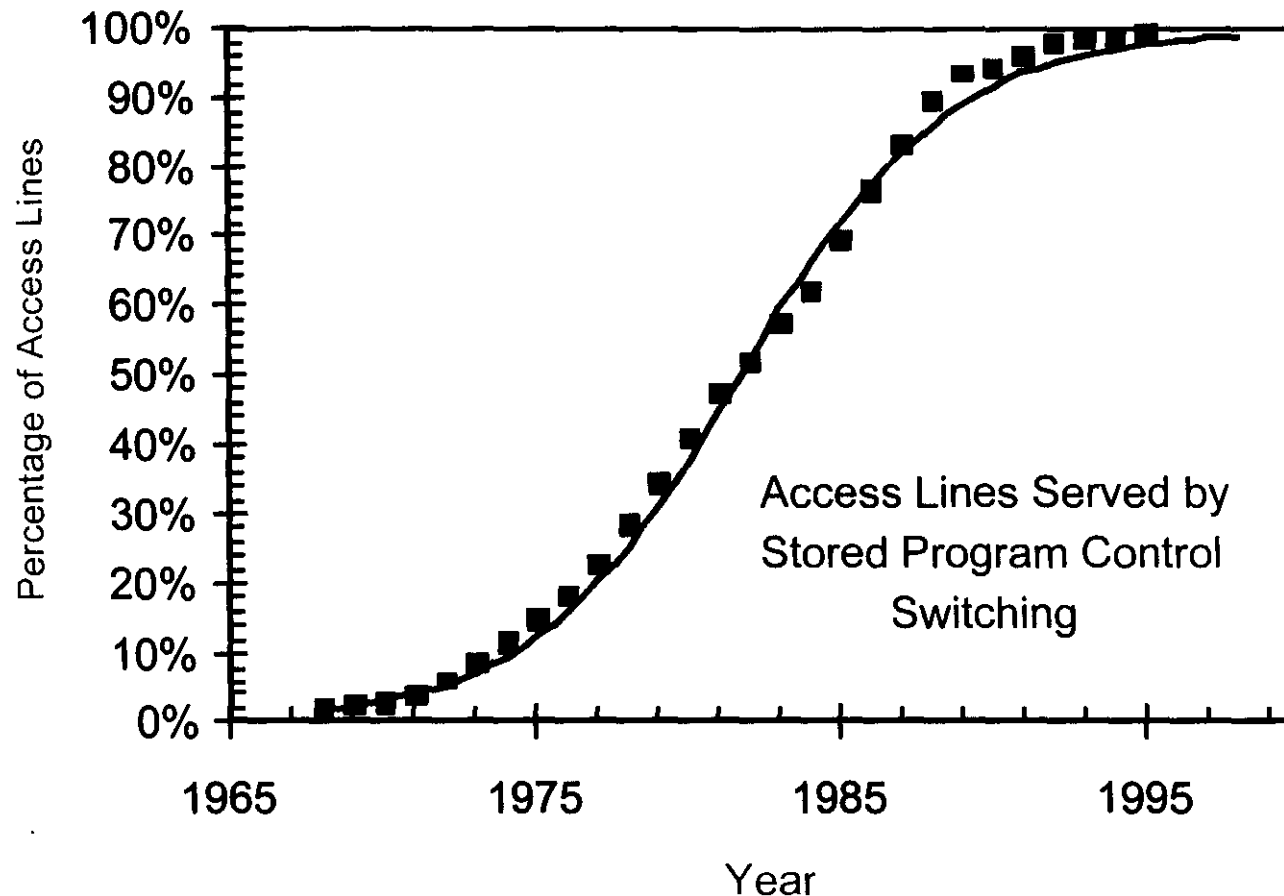


$y(t)$ = Fraction of market taken over by new technology at time “t”

“a” and “b” are constants to be determined from substitution data



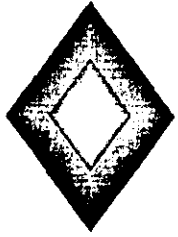
Stored Program Control Switching



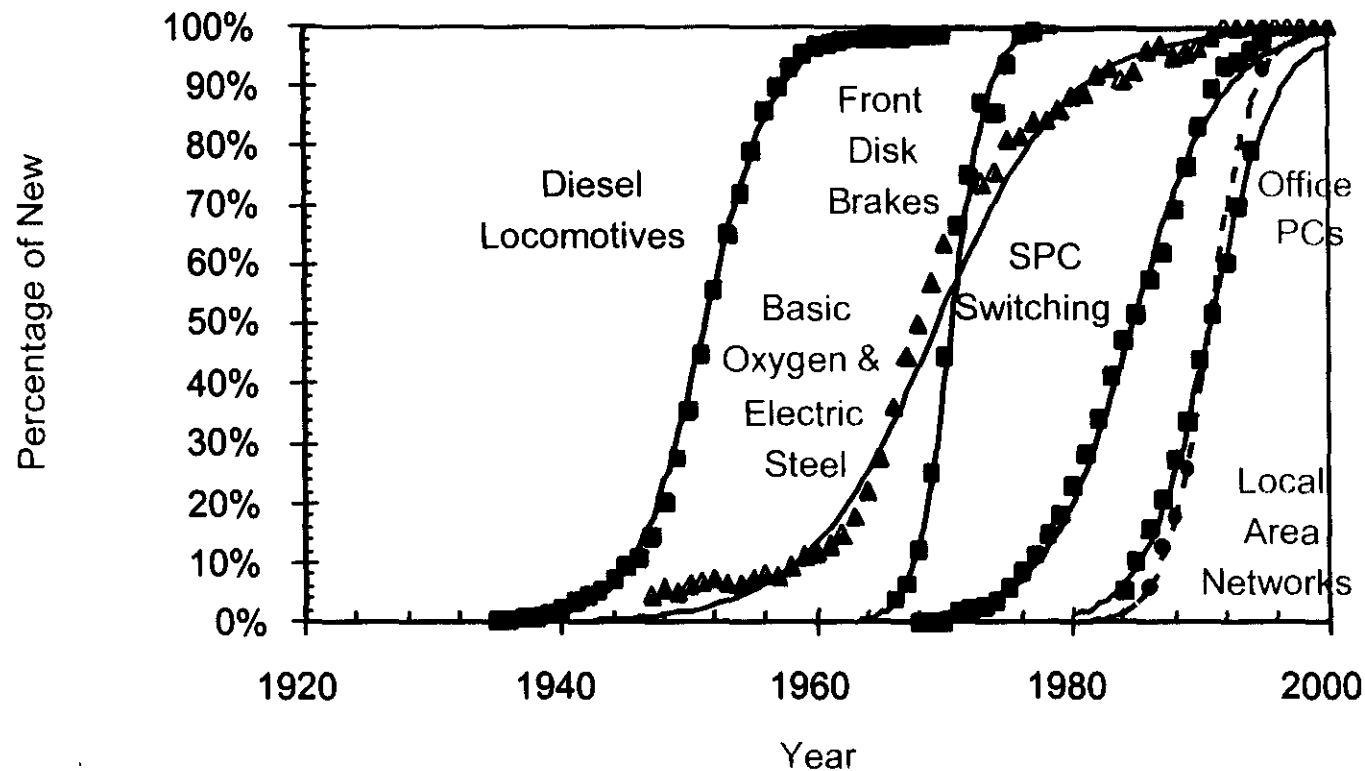
Switches-spc-s

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Fisher-Pry Substitution Examples



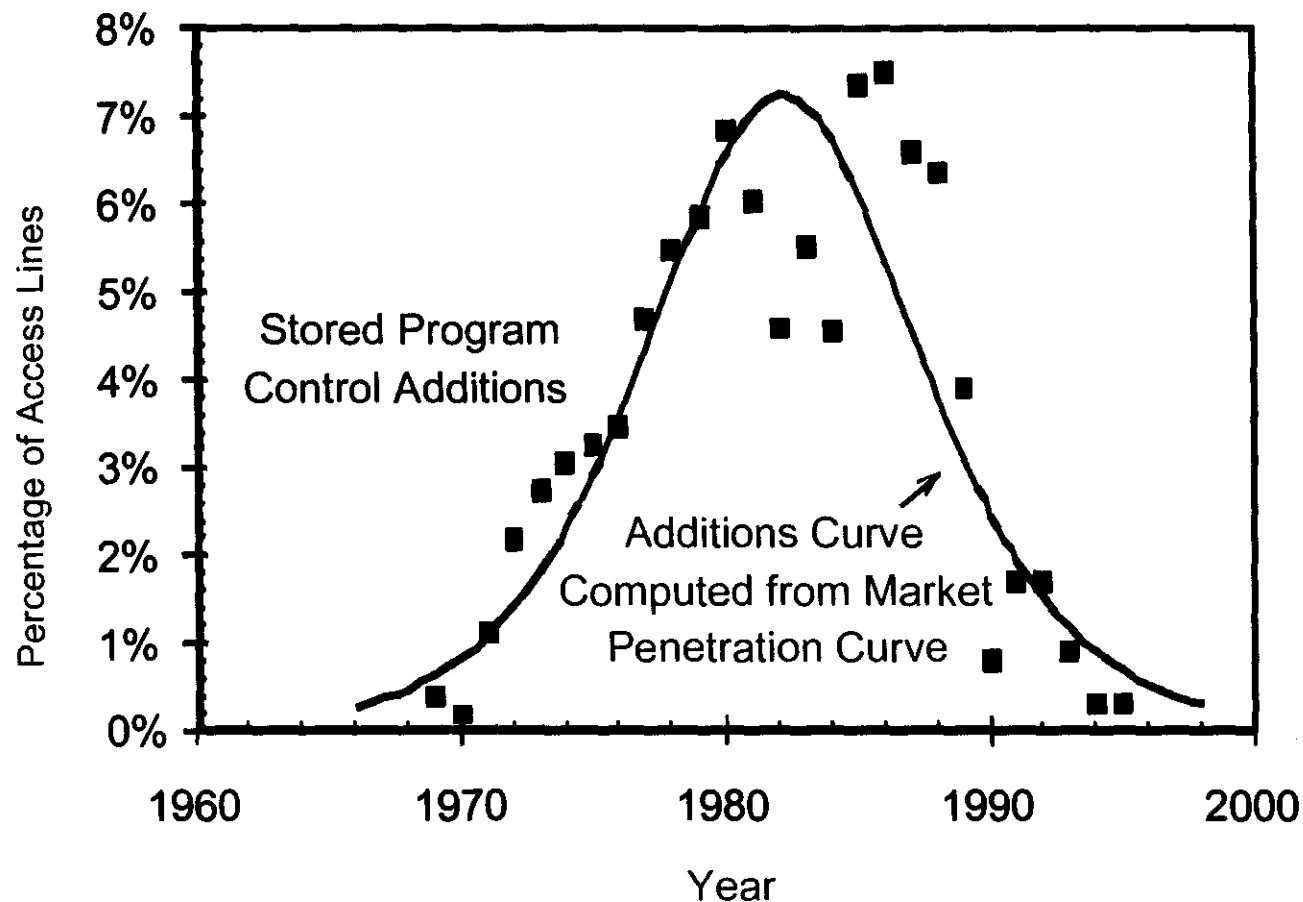
FP Examples

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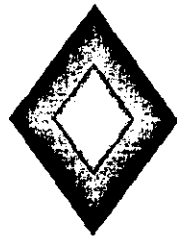
Additions of Stored Program Control Switch Access Lines (Fisher-Pry)



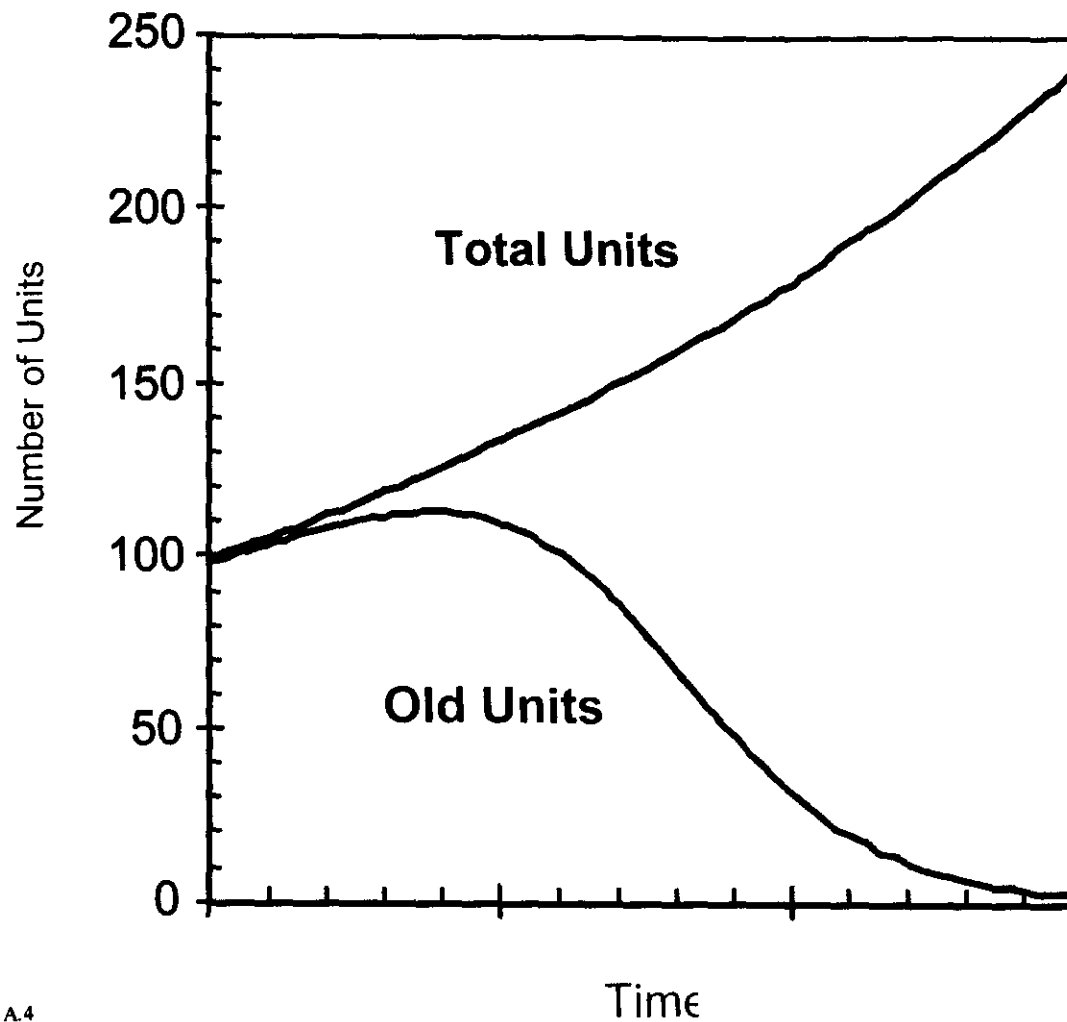
Switches-Adds

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Substitution in a Growing Market



TLEN2 A.4

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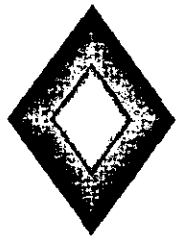


Substitution Special Cases

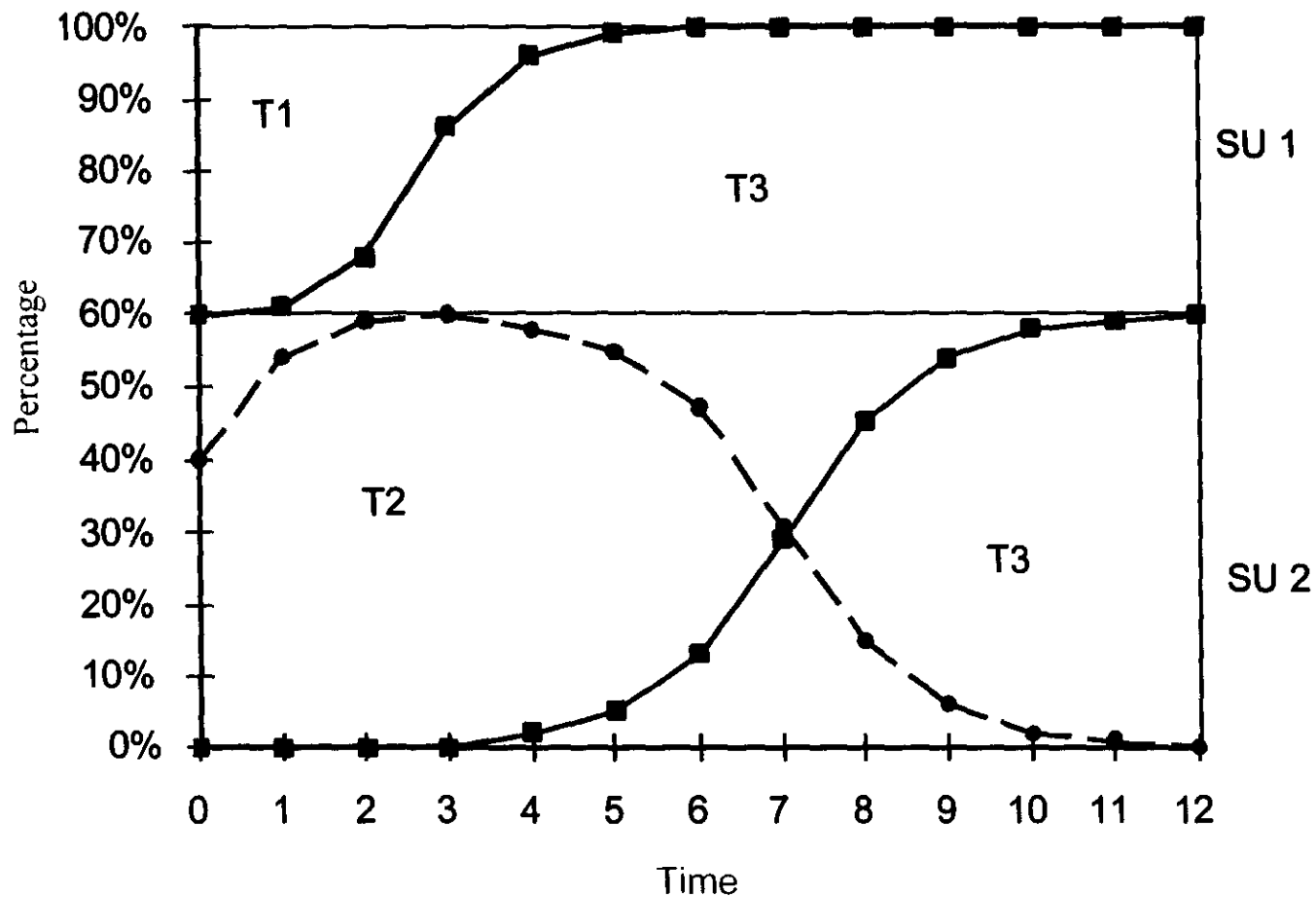
- Multiple substitution
- Capital constraints
- Market segmentation
- Linked substitutions
- Aggregation problems
- Failure to make improvements
- Last gasp advances in old technology

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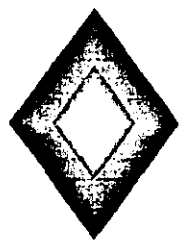
Non-Homogeneous Multiple Substitutions



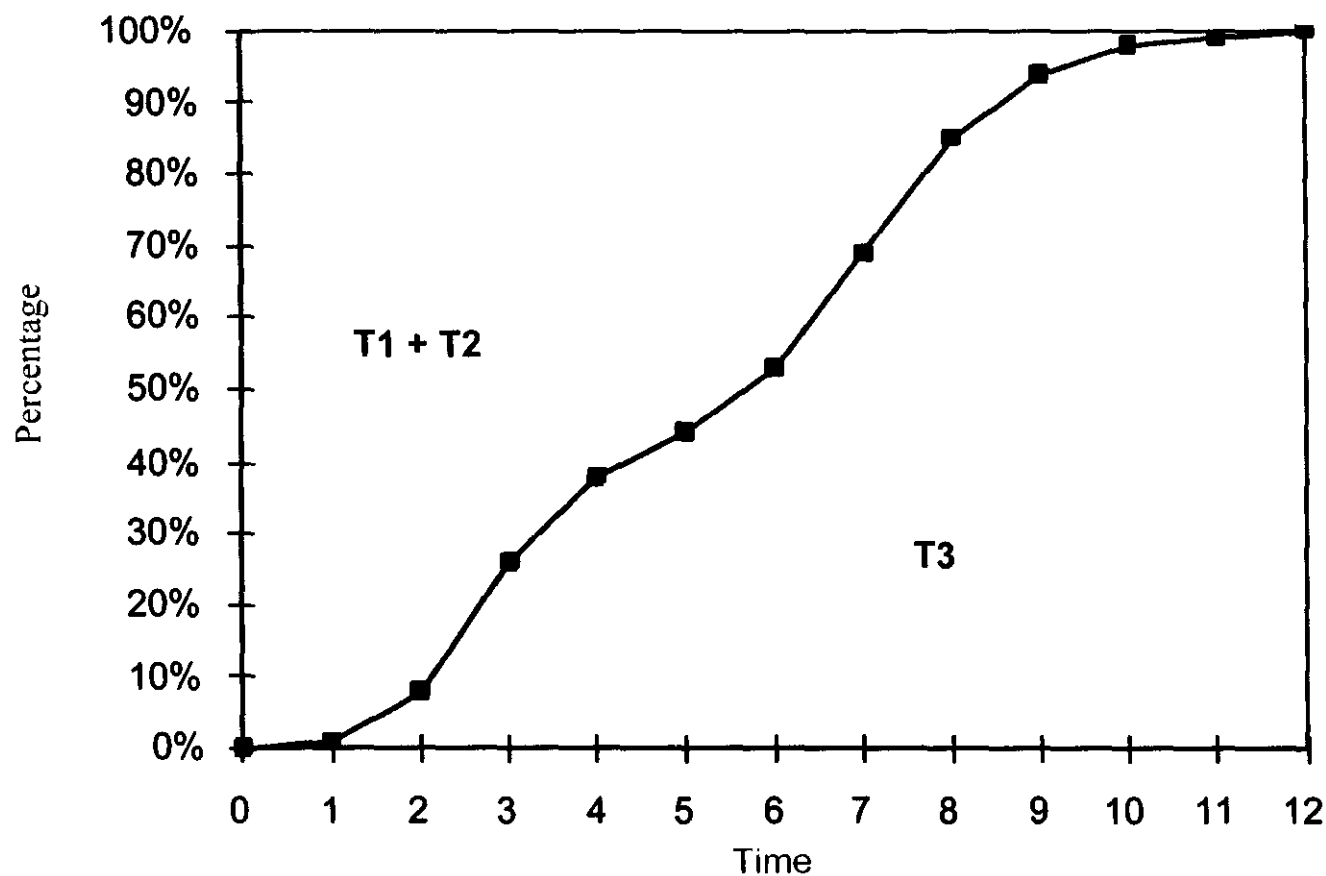
Mult Sub2-sh3

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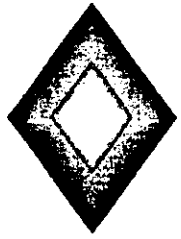
Non-Homogeneous Multiple Substitutions



Mult Sub2-sh2

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Types of Depreciation Lives

- Economic—Theoretical (cash flow)
- Economic—Applied (usage-based)
- Retirement-based

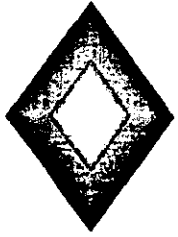


Traditional Depreciation Approach

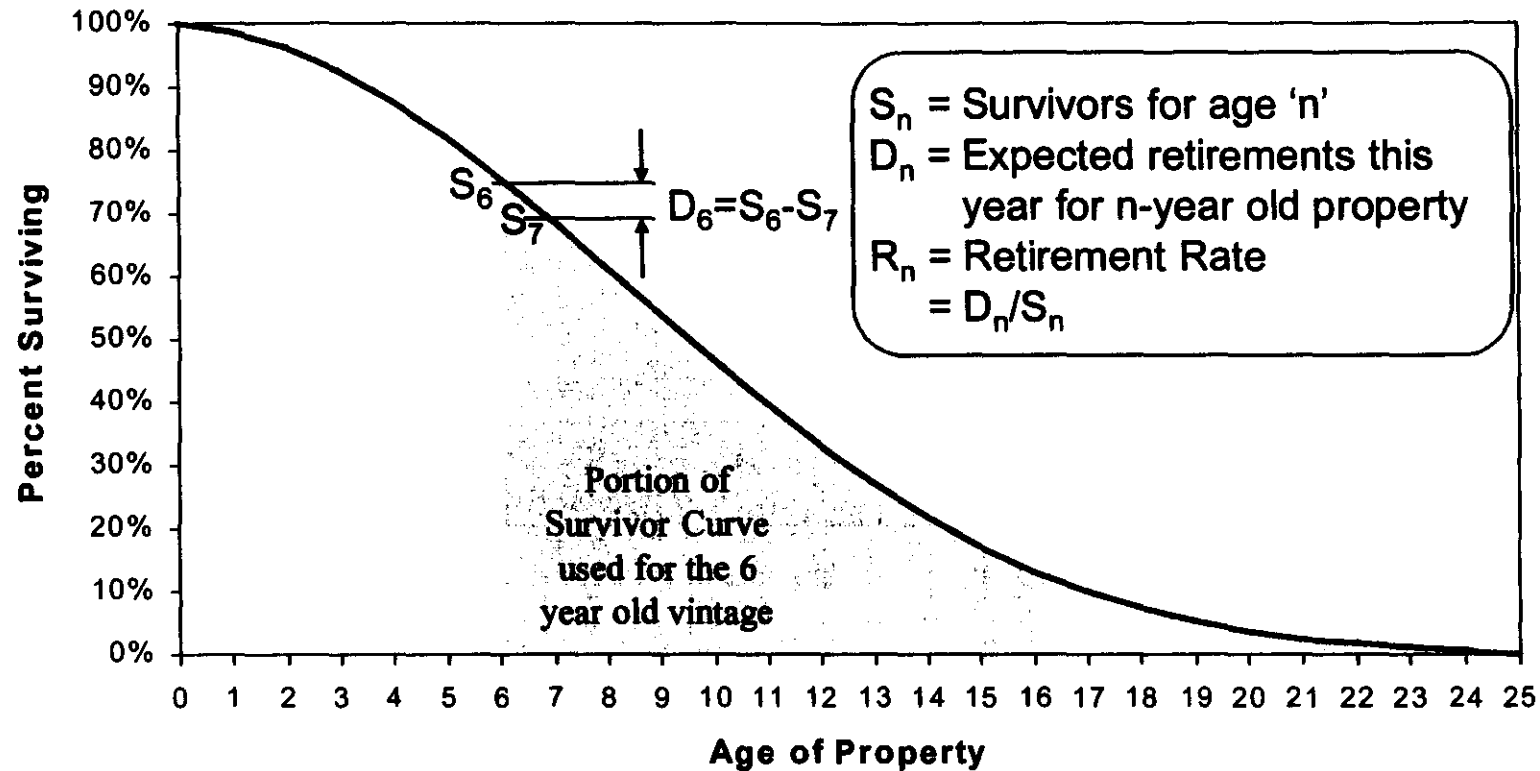
- Life indicators (past experience)
- Life estimation (other factors)
- Projection life & survivor curve (new equipment)
- Generation arrangement (ages of existing)
- Average remaining life (what's left)
- Depreciation rate

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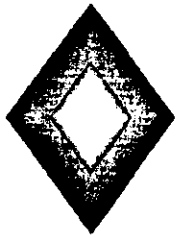


Typical Mortality Survivor Curve

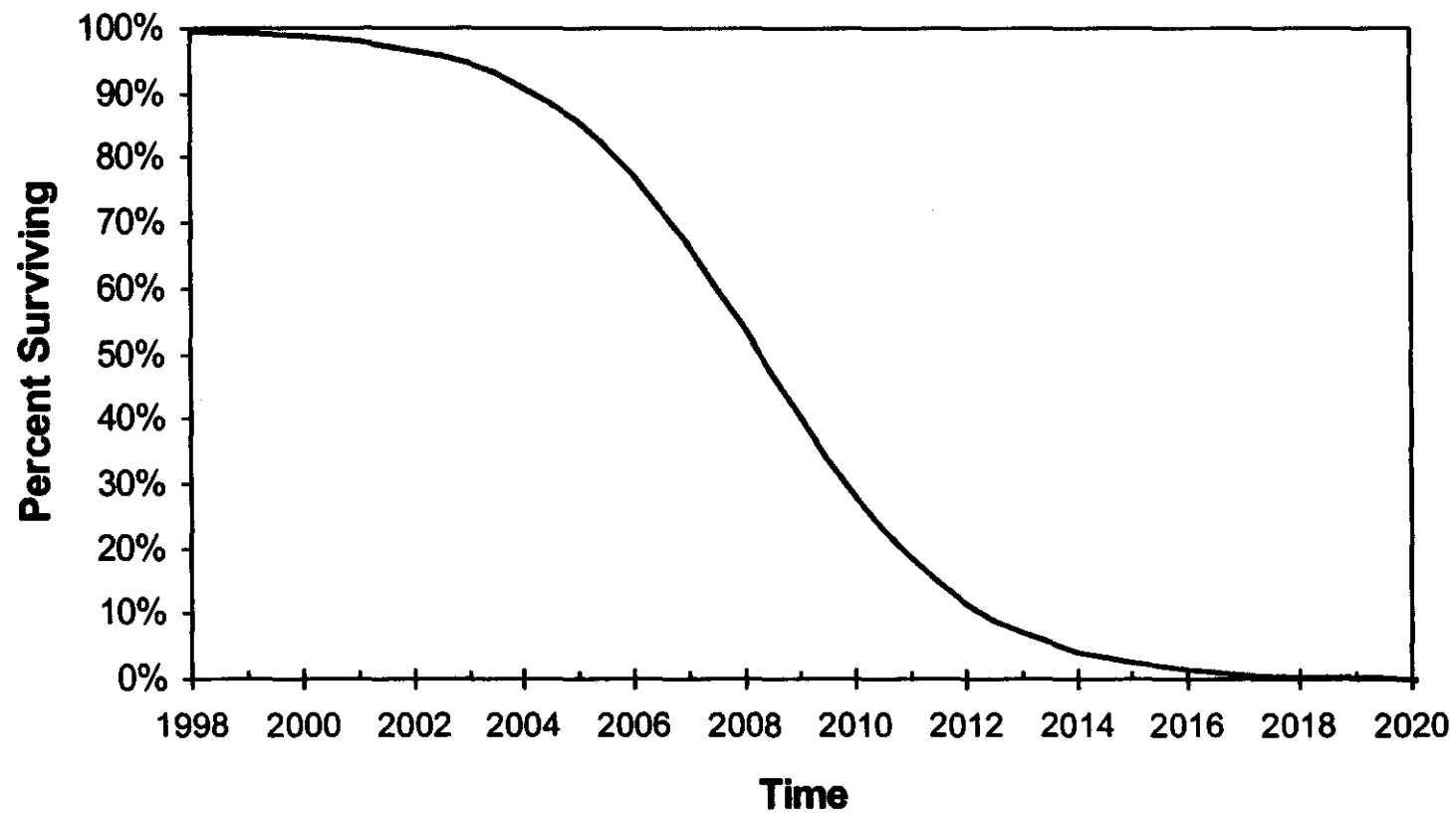


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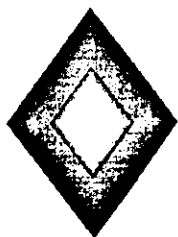


Typical Life Cycle Chart



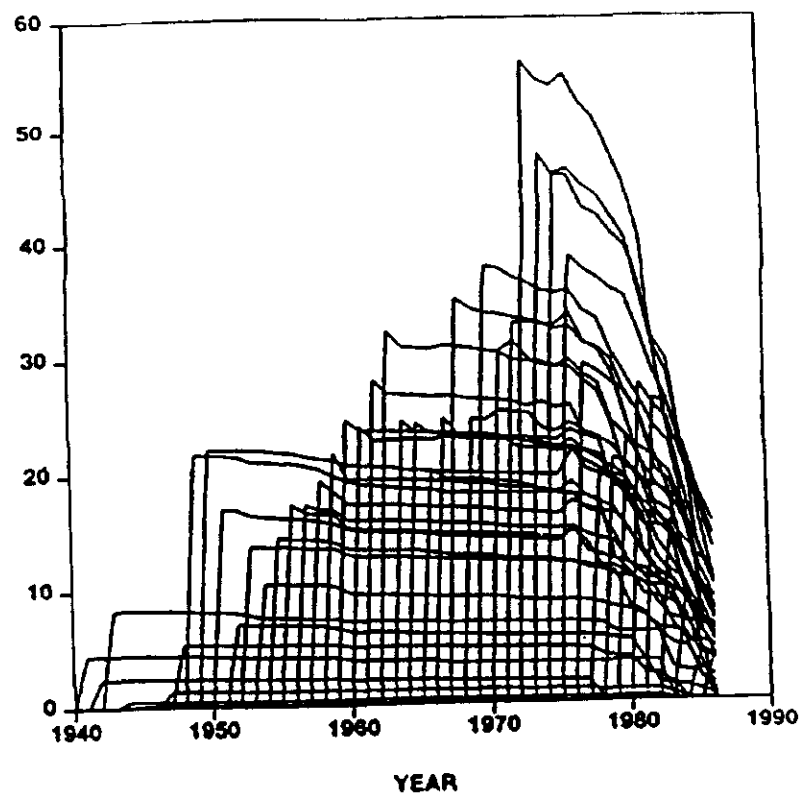
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Avalanche Curves

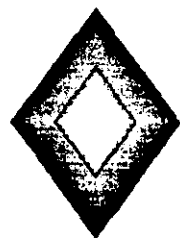
Vintage Survivor Curves
1940-1985 Crossbar Vintages
Plant in Service (Million Dollars)



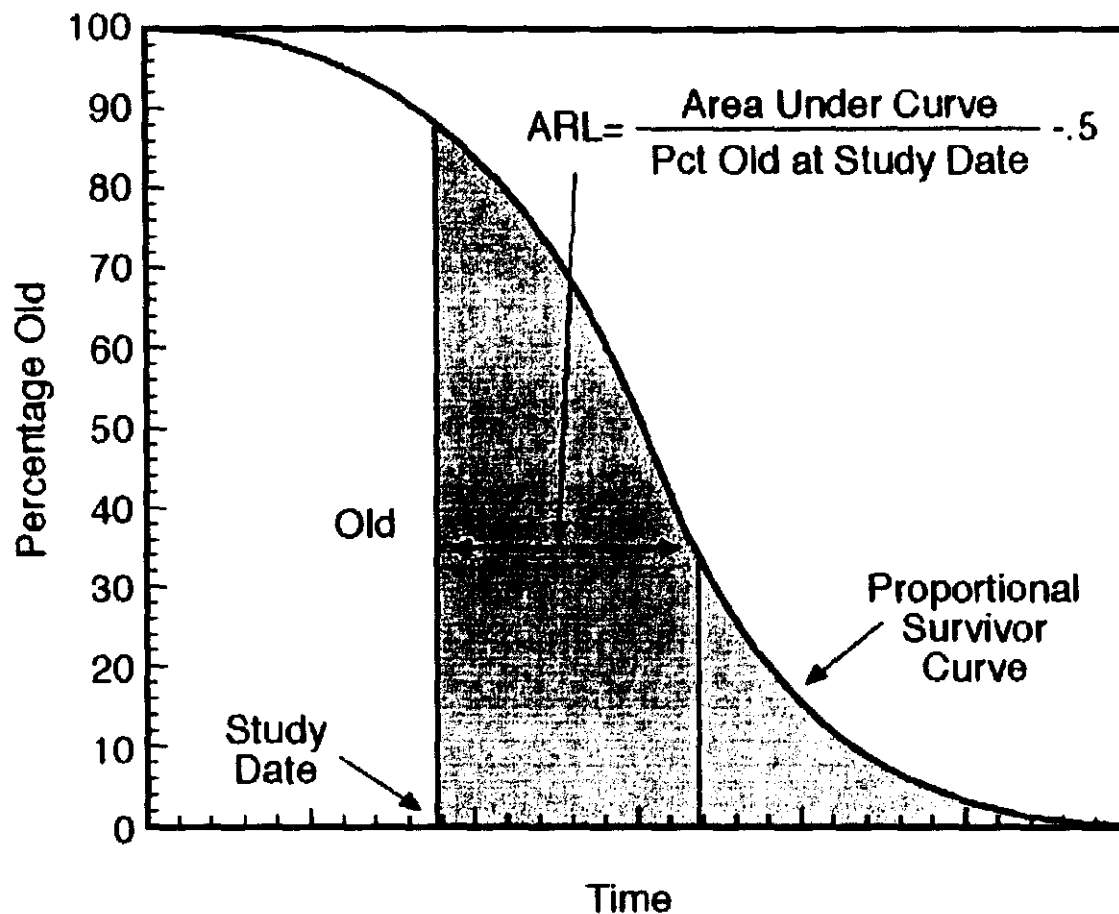
Source: Bellcore

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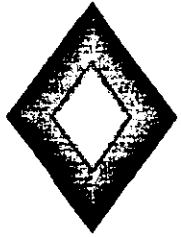


Estimating Average Remaining Life Using Substitution Analysis



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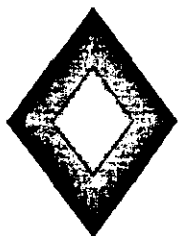
Comparison of Approaches

Traditional Mortality

- Retirements
- Mortality
- Historical

Substitution Analysis

- Equipment Usage
- Obsolescence
- Forward-looking



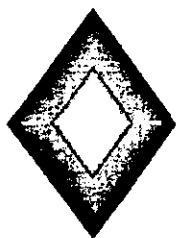
Comparison of Remaining Life Results

| | Electromechanical Switching | IOF Underground Metallic Cable | Analog Switching |
|-----------------------|--------------------------------|-----------------------------------|---------------------|
| Observed Life | 5.07 | 4.23 | 4.44 |
| Traditional Mortality | 15.67 | 23.58 | 10.14 |
| Substitution | 5.44 | 3.45 | 3.32 |
| Combined Obsolescence | 5.60 | 4.22 | 3.92 |

The Observed Lives shown here are usage-based lives.

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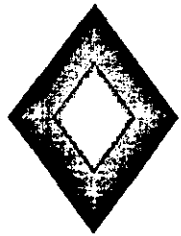


Summary of TFI Industry Life Recommendations

| Technology | Average Remaining Life (1/1/97) | Projection Life—New Investment | Projection Life—Existing Investment |
|--------------------------|------------------------------------|-----------------------------------|--|
| Outside Plant | | | |
| <i>Copper Cable</i> | | | |
| Interoffice | 2.8 | 3 | 8-10 |
| Feeder | 7.2 | 7 | 15-17 |
| Distribution | | | |
| Early Scenario | 8.1 | 10 | 14-18 |
| Middle Scenario | 9.8 | 12 | 15-20 |
| Late Scenario | 11.5 | 14 | 17-23 |
| TFI Recommended | 8-10 | 10-12 | 14-20 |
| <i>Fiber Cable</i> | | | |
| All Categories | 12-16 | 20 | 20 |
| Circuit Equipment | | | |
| Analog | 2.1 | --- | --- |
| Non-SONET (Digital) | 3.6 | 4 | 6-9 |
| SONET | 5-8 | 8 | 8 |
| Switching | | | |
| Analog | 2.1 | --- | --- |
| Digital | 6.3 | 8 | 9-12 |

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Summary

- There is a rigorous methodology for forecasting technology change
- It is applicable to economic life estimation
- It has a proven track record
- It is superior to traditional methods when technology obsolescence is important
- It's the industry gold standard for economic lives
- Studies are documented



LAWRENCE K. VANSTON, PH.D.

President

Technology Futures, Inc.

Dr. Lawrence Vanston is an internationally recognized authority in the use of technology forecasting in the telecommunications industry. As president of Technology Futures, Inc., Dr. Vanston has been monitoring, analyzing, and forecasting telecom technologies and services for more than 20 years. His research reports and forecasts are used and referenced extensively by telecom managers and professionals worldwide. As an expert on the impacts of new technologies and markets on the public telephone network, he is frequently called upon to testify before state and federal regulatory commissions.

Since 1985, Dr. Vanston has been the director and principal author of a number of ongoing reports commissioned by the Telecommunications Technology Forecasting Group (TTFG), which is comprised of Bell Atlantic, Bell Canada, BellSouth Telecommunications, Cincinnati Bell, GTE Telephone Operations, Sprint-LTD, and U S WEST Communications. Topics have included Internet access requirements, xDSL technologies, ATM switching, fiber optics, video services, and wireless communications. Most recently, the provocative TTFG report entitled *Wireless vs. Wireline for Voice Services: Forecasts and Impacts* has drawn widespread industry attention.

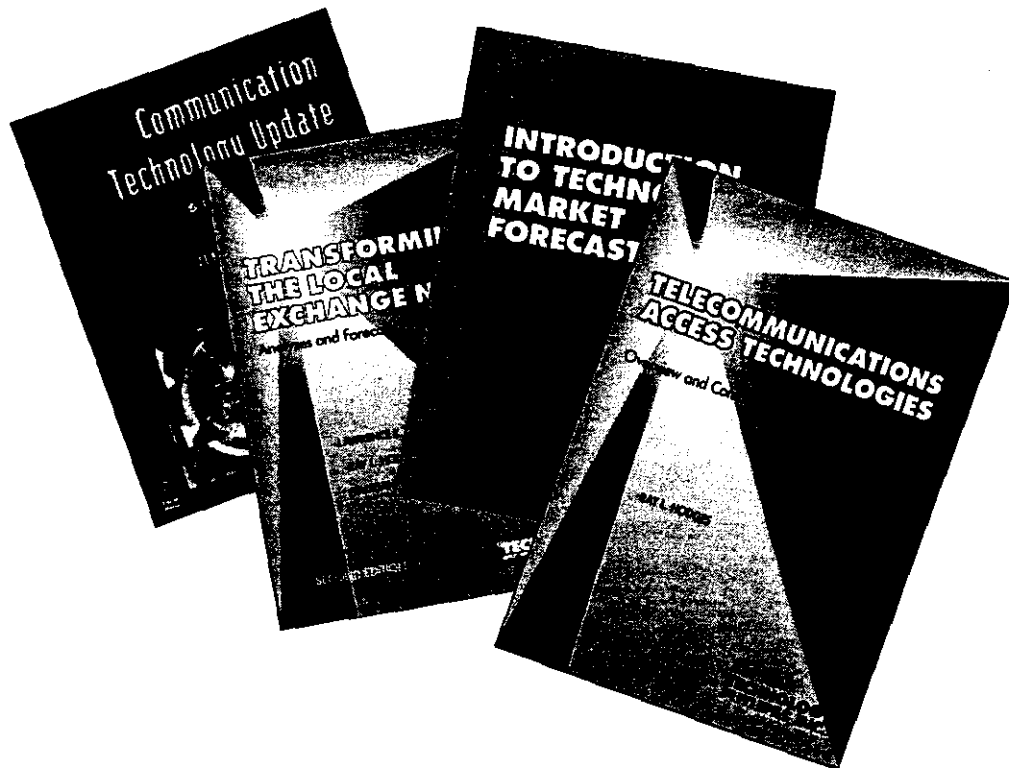
Dr. Vanston's views and the results of his research are regularly cited by general business and industry publications including the *Wall Street Journal*, *Telephony*, *America's Network*, *Wired*, *Lightwave*, *Wireless Systems Design*, and *Communications News*. The September 21, 1998 issue of *The Wall Street Journal* contained an in-depth interview with Dr. Vanston entitled "Consultant's Call: Lawrence Vanston Makes Some Pretty Bold Predictions for the Future of Telecommunications. He Has Been Right Before."

Dr. Vanston is also a popular speaker on the subject of the future of telecommunications and its significance to organizations and people. He recently served as keynote speaker at the Global Business Forum and has spoken at such prestigious programs as the Pacific Telecommunications Conference, the International Engineering Consortium's ComForum, SUPERCOMM, the Brazil Telecom Summit, and USTA's Capitol Recovery Seminar. Attendees of the 1993 National Telecommunications Forecasting Conference (now International Communications Forecasting Conference) honored Dr. Vanston as Outstanding Speaker of the Year. In addition, he directs the popular ongoing TFI business seminar, *Technology Forecasting for the Telecom Industry*.

Before joining Technology Futures in 1984, Dr. Vanston spent four years with Bell Labs and Bellcore in network planning where he proposed and evaluated potential new long distance, billing, access, and data services. Prior to that, he was with the Texas Petroleum Research Committee and the Center for Energy Studies at the University of Texas at Austin. His academic achievements include a B.A. in government (1975) and an M.S. (1977) and Ph.D. (1979) in operations research and industrial engineering, all from the University of Texas at Austin.

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Publications



Market Reports

- Telecommunications Access Technologies
- Wireless vs. Wireline for Voice Services
- Communication Technology Update
- Computer Technology Trends
- Wireless and Cable Voice Services
- Comparison of Economic Life Techniques
- Transforming the Local Exchange Network: 2nd Edition
- Advanced Video Services
- Depreciation Lives for Telecommunications Equipment
- Transforming the Local Exchange Network: 1994 Edition

Forecasting Guides

- Introduction to Technology Market Forecasting
- Technology Forecasting
- Practical Technology Forecasting

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6th Edition

August E. Grant, Editor

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Contents

Introduction: The Umbrella Perspective on Communication Technology

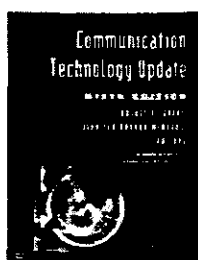
Electronic Mass Media: Cable Television • Pay Television Services • Interactive Television • Direct Broadcast Satellites • Wireless Multipoint Distribution Services: MMDS & LMDS • Advanced Television • Radio Broadcasting

Computers & Consumer Electronics: Multimedia Computers & Video Games • Computers in Media: Media Asset Management • The Internet & the World Wide Web • Electronic Mail • Office Technologies • Document Printing Technologies • Virtual & Augmented Reality • The Digital Revolution in Home Video • Digital Audio

Telephony & Satellite Technologies: Local and Long Distance Telephony • Broadband Networks • Satellite Communications • Distance Learning Technologies • Cable Distributed Telephony & Data Services • Wireless Telephony: Cellular, PCS, & MSS • Personal Communication: Pagers, Palmtops, & PDAs • Teleconferencing

Conclusions: Trends in Selected U.S. Communications Media

\$50, July 1998, 375 pages, Softcover



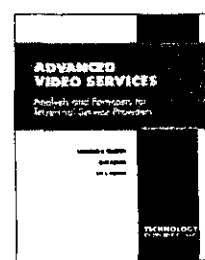
ISBN 0-240-80326-4
Published by
Butterworth-Heinemann

Advanced Video Services: Analysis and Forecasts for Terrestrial Service Providers

Lawrence K. Vanston, Curt Rogers,
& Ray L. Hodges

This report forecasts likely technology adoption strategies of the local telephone companies and assesses of the impact on their existing networks.

\$495, 1996, 132 pages, Softcover, Sponsored by the TTFG*



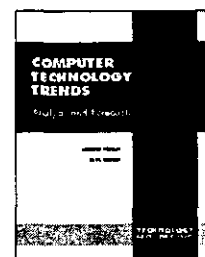
ISBN 1-884154-05-0

Computer Technology Trends: Analysis and Forecasts

Adrian J. Poiras & Ray L. Hodges

This insightful report focuses on the effects of technical progress in computers, along with continually expanding requirements and utility. Also covered is the rapid obsolescence and replacement of both existing and new computer assets and related equipment.

\$495, 1996, 63 pages, Softcover, Sponsored by the TTFG*



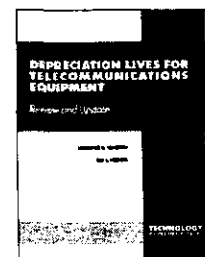
ISBN 1-884154-06-9

Depreciation Lives for Telecommunications Equipment: Review and Update

Lawrence K. Vanston & Ray L. Hodges

This 1995 report updates the calculations for depreciation lives and summarizes the results of TFI's 1994 research report, Transforming the Local Exchange Network: Analyses and Forecasts of Technology Change.

\$45, 1995, 51 pages, Softcover, Sponsored by the TTFG*



TFI ARCHIVE

- **Personal Communications** \$45, 1993
- **New Telecom Services & the Public Telephone Network** \$45, 1993 (Out of Print)
- **Telecom for Television/Advanced Television** \$45, 1992
- **Video Communications** \$45, 1992
- **Local Area Network Interconnection** \$45, 1992
- **Interactive Multimedia & Telecommunications** \$45, 1992
- **Computer-Based Imaging & Telecommunications** \$45, 1991 (Out of Print)
- **A Facsimile of the Future** \$45, 1991

All of these archive publications were sponsored by the TTFG*
Photo copies are available for Out of Print publications.

Transforming the Local Exchange Network: Analyses and Forecasts of Technology Change

1994 Edition

Lawrence K. Vanston

This research report quantifies the replacement of older telecom technologies with new high-speed, high-bandwidth telecom technologies—fiber optics, SONET, and ATM—by the LECs. It is focused primarily on the management of capital, including both the realistic assessment of the usefulness and longevity of existing assets, as well as the need for new investment to provide the basis for earnings, growth, competitiveness, and satisfied customers in the future.

\$95, 1994, 200 pages, Softcover, Sponsored by the TTFG*



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- A toolbox of practical, proven forecasting techniques.
- The ability to project how rapidly new technologies will be adopted in the marketplace.
- Practical experience in planning technology-based programs and projects.
- The ability to identify and evaluate emerging market needs.
- Unique insights in how technology advantage can be established and profitably employed.
- Interaction with other professionals involved in technology/market forecasting and planning.
- Presentation notes and copies of TFI publications, *Technology Forecasting: An Aid to Effective Technology Management* and *Introduction to Technology Market Forecasting*.



Please call or visit our Website for future course dates and locations.

Toll Free (800) TEK-FUTR [835-3887]

www.tfi.com

TELECOM TRENDS: MARKETS & TECHNOLOGIES

Drawing heavily on examples and recent forecasts from the telecom industry, this seminar will provide the participant with an excellent overview of trends in the industry.

SEPTEMBER 16-17, 1999, Austin, TX

What You Will Gain

- TFI's latest forecasts on emerging markets and technologies for data services, including both wireline and wireless.
- A broad perspective on changes and aspects of telecommunications.
- Discovery of interrelationships among industry trends.
- An appreciation of the implications of forecasted changes for you and your organization.
- Interaction with other professionals interested in the future of telecommunications.
- Special focus sections on *Telecom Trends* and *Telecom Markets*.
- Presentation notes and a copy of the publication, *Introduction to Technology Market Forecasting*.

FORECASTING, PLANNING & MANAGING TECHNOLOGY

Who Should Attend

You should attend if you are involved in:

- Identifying new business opportunities
- Projecting advances in technology
- Developing market strategies
- Analyzing competitive threats
- Developing R&D and/or business plans
- Managing technology projects and programs

Course Topics

Principles of Technology Forecasting, Planning, and Management (TFP&M)

- A new concept for integrating market pull, technology push, and competitive clash into strategic planning and management activities.

A Starting Point for Planning

- A practical tool for the examination of the higher-order, non-obvious factors that could affect the long-term success or failure of your organization.

New Concepts in Strategic Planning

- A review of emerging strategic planning and management approaches and concepts.

Projecting Advances in Technology: No Limit Situations

- Using technology trend analysis in situations where no growth limit is evident

Identifying Emerging Market Opportunities

- Use of the Nominal Group process to identify and provide preliminary evaluation of emerging business opportunities

Projecting Advances in Technology as Limits Are Approached

- Using technology trend analysis when technology limits are being approached

Defining New Business Opportunities

- The role of technology in new business elements and how these work within existing strategic tactical and result management systems

Simple Substitution Analysis

- Techniques including Fisher-Pry and Gompertz curves for projecting the rate of adoption of new technologies.

Using Expert Opinion to Improve TFP&M

- Use of expert opinion techniques such as Delphi Surveys and unstructured interviews to enhance the validity of forecasts and the effectiveness of planning and management.

Multiple Substitution Analysis

- An advanced technique for projecting simultaneous substitutions among multiple technologies.

The Role of Technology Forecasting in Strategic Planning

- How these techniques can be used to enhance the utility and timeliness of strategic plans, including an overview of cooperate-compete relationships.

Identifying and Evaluating Competitive Threats

- Practical techniques, including Morphological Analysis, for determining the capabilities and intentions of competitors.

Formulating a Strategic Plan

- How roadmaps can be used in the formulation of effective strategic plans. Will also examine basic problem solving.

Application of TFP&M Techniques

- Examination of how the material presented in this workshop can best be integrated into the TFP&M processes in your organization.

Mining for Relevant Data

- Practical, proven techniques for efficiently gathering and analyzing data.

Testing the Plan in a "Real World" Environment

- Analysis of possible reactions to your plan, and how these reactions can be turned to your advantage.

Adding Flexibility to the Plan

- The use of alternate scenarios to add flexibility to your organizational plans.

Practical TFP&M Tips

- Lessons learned in 20 years of forecasting and planning.

Effective Use of TFP&M Concepts

- A discussion of how the concepts and techniques can be employed most effectively in your organization.

Gaining Acceptance of the Plan

- Methods for gaining acceptance of your plans and how the plan can best be translated into action.

TELECOM TRENDS: MARKETS & TECHNOLOGIES

Who Should Attend

- Regional Bell Operating Companies
- Independent Telcos
- Competitive Local Exchange Carriers
- Competitive Access Providers
- Cellular/PCS Wireless Providers
- Long Distance Carriers
- Internet Service Providers
- Cable Companies
- Telecom Industry Suppliers
- Regulatory Agencies
- Telecom R&D Groups
- Corporate Telecom Planning Groups

Course Topics

Fundamental Drivers in Telecommunications

- The fundamental, long-term drivers that are shaping the telecom industry and its role in business and society.
- Why telecom is now such a dynamic and turbulent industry.

Forecasts for Internet/Online

Access

- Forecasts for residential digital access and data rate requirements.
- Strategies for providing high-speed services.
- Forecasts for the adoption of ADSL and fiber optics.

Packet vs. Circuit Switching and Internet Voice

- Forecasts of the transition to ATM and IP switching.
- Prospects for voice on the Internet
- Strategic issues for various carriers.

Implications of Convergence

- Group exercise to assess the impact of convergence from technology, market, and business perspectives.

Forecasts for Wireless Communications

- Trends in capacity, competitors, and usages.
- Forecasts of subscriber demand and price of cellular/PCS services
- Discussion of digital technologies such as TDMA, GSM, and CDMA.
- Forecasts for the adoption of digital technologies.

Wireless Local Loop

- Technology alternatives: CDMA, LMDS, MMDS, and G3.
- Potential for voice, low-speed data, and Internet access.
- Forecasts for advanced WLL technologies.

Competitive Impacts on Voice Services

- Modeling and forecasting the impact of wireless on wireline voice services.
- Projecting the impact of competition on telco revenues and asset lives.

Implications of Wireless

- Group exercise to assess the impact of wireless communications from technology, market, and business perspectives

Forecasts for Fiber and SONET/SDH Adoption

- Patterns of adoption of fiber optics in communications networks.
- Drivers for SONET/SDH adoption and forecasts of SONET/SDH adoption in public telecom networks.

Forecasts for Switching Equipment

- Patterns of adoption of switching equipment.
- Modular change-outs in digital switches.
- Drivers for ATM adoption and forecasts of ATM adoption in public telecom networks.

Forecasts for Broadband Access

- Technology alternatives: HFC, FTTC, ADSL, etc.
- Competitive scenarios.
- Winning long-term strategies.

Implications of Telecom Changes

- Group exercise to assess the impact of broadband, ATM, and SONET from technology, market, and business perspectives.

Special Topics (Optional)

Special sessions will depend on the interests and priorities of the attendees. The topics below have been presented at recent courses. Additional special focus sessions may be organized at the request of participants. Please contact TFI to make suggestions.

- Technology Forecasts for Depreciation
- Critical Infrastructure
- Demand Forecasting Applications
- Issues for the Cable Industry
- Interconnection and Universal Service
- Wireless Data Indexes and Forecasts

Course topics are subject to change

Course Leaders

For complete staff biographies, please visit our Webpage at www.tfi.com/Staff

John H. Vanston, Ph.D., Chairman, TFI
Course Director for
Forecasting, Planning, & Managing Technology



John founded TFI in 1978 and served as its president for 14 years. He has been actively involved in technology management and forecasting for over 25 years. He is an internationally-renowned educator, author, and consultant in technology forecasting, technology/market integration, and technology management in uncertain environments.

David Smith, Vice President, TFI

David's extensive background includes management, design, and implementation of information-based operations in both the public and private sectors.

George E. Alberts, Senior Consultant, TFI

George recently joined TFI after 33 years with the National Security Agency. His expertise includes technology forecasting, mathematics, computing, and promoting strategic alliances.

Judith McCrackin

Associate Senior Consultant

Judith works actively with TFI in consulting and training. Her specialties include organizational design and development, leadership, and process training.

Lawrence K. Vanston, Ph.D., President, TFI
Course Director for
Telecom Trends: Markets & Technology



Larry is a recognized authority in the use of technology forecasting in the telecom industry. His interests center on the adoption of new technology for telecom networks and future services. As an expert on the impacts of new telecom technologies and markets on the public network, Larry is often called on to testify before state and federal regulatory commissions.

Stephen L. Barreca, P.E.

Associate Senior Consultant

Steve is an authority in forecasting the evolution of emerging technologies and assessing their strategic, marketing, and business implications.

Ray L. Hodges, Senior Consultant, TFI

An early user of technology forecasting, Ray's focus at TFI is on emerging wireless technologies and markets and their impacts on the public telecom network.

A. W. (Bill) Kleinebecker

Senior Consultant, TFI

Bill has extensive experience in defining market requirements, system objectives, and product solutions in a wide range of computer and software technologies.

TECHNOLOGY FUTURES INC.

TFI helps organizations plan for the future.

Since 1978, we have been conducting technology and market forecasts. As a result, we have developed an extensive toolkit of proven, quantifiable forecasting methods and strategic applications. Headquartered in Austin, Texas, we work with leading technology and industrial companies to provide a forward-looking vantage point for making sustainable business decisions.

TFI has been the primary contractor for the Telecommunications Technology Forecasting Group (TTFG) since its inception in 1985. Made up of many local exchange carriers, the TTFG promotes the understanding and use of forecasting to predict and support the continuing evolution of the public telecom network.

These are some of the organizations recently represented at TFI seminars:

| | | |
|------------------------|------------------|----------------------|
| Alcatel | Eastman Kodak | Raytheon |
| AMD | Ernst & Young | Rockwell |
| AT&T | Fisher-Rosemount | Rosemount |
| Bell Atlantic | General Electric | Siecor |
| Bell Canada | General Motors | Southwestern Bell |
| Bell Northern Research | GTE | Sprint |
| BellSouth | Hughes | 3M |
| Chevron | IBM | Telcordia |
| Corning | MCI | Telefonica de Espana |
| Deere & Co. | Mobil | Telegraph Canada |
| Deloitte & Touche | Motorola | Telstra |
| Deutsche Telekom | Nokia | TELUS |
| Dow | Nortel | U.S. WEST |
| Eastman Chemical | Pacific Bell | VTel |

Registration Form

Attend both courses and save \$440.



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Course Tuition: \$1,950 (U.S. Dollars)*

FORECASTING, PLANNING & MANAGING TECHNOLOGY

☐ **Yes!** Please Enroll Me! Course Tuition: **\$1,095 (U.S. Dollars)***

September 13-15, 1999, Sheraton Austin Hotel, Austin, TX

This session will start Monday, 8:30 A.M. and end Wednesday, 2:50 P.M.

Please call or visit our Website for future course dates and locations.

TELECOM TRENDS: MARKETS & TECHNOLOGIES

☐ **Yes!** Please Enroll Me! Course Tuition: **\$1,295 (U.S. Dollars)***

September 16-17, 1999, Sheraton Austin Hotel, Austin, TX

This session will start Thursday, 8:30 A.M. and end Friday, 5:00 P.M.

Please call or visit our Website for future course dates and locations.

To reserve a room, please contact the **Sheraton Austin Hotel**, 500 North I-35, Austin, TX 78701

Telephone **(512) 480-8181** or **(800) 325-3535**. (Worldwide Reservations). Ask for the **Technology Futures, Inc.** room rate.

TO REGISTER

Fax: (512) 258-0087

Telephone: (800) TEK-FUTR [835-3887] or (512) 258-8898

E-mail: seminars@tfi.com

Mail: Technology Futures 13740 Research Blvd, Bldg. C, Austin, TX 78750-1859

*ADMINISTRATIVE DETAILS

1. Make checks payable in U.S. Dollars to **Technology Futures, Inc.**. We also accept Visa, MasterCard, and American Express.

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2. The tuition includes all supplies, study materials, continental breakfast each day, and a reception/barbecue. The participant is responsible for payment of hotel accommodations and other meals.
3. If cancellation is received one month prior to the starting date of a workshop, a full refund will be made. After that date, committed charges of \$150 will be deducted from the refund. No refund will be made for cancellations received the week preceding a workshop. Substitution of participants is accepted at any time. One transfer per participant is accepted at any time prior to the seminar. If the transferred session is not attended, the original cancellation policy will apply.
4. Multiple participant discount: One person pays full price. Any additional participant(s) from the same company may receive a 20% discount. Participants must register for the same session and must request the discount when registering.
5. No audio or video devices permitted.
6. Enrollment is limited.

Name _____

Title _____

Company _____

Address _____

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Telephone _____ Fax _____ E-mail _____

**Past participants attest to the timeliness,
value, and quality of TFI's seminars**

"This course is excellent in showing the complexities of the industry in simple terms. It is critical that more people are exposed to such analyses in order to better understand the increasingly competitive telecom industry. I especially appreciated the speakers' ability to make comparisons in technology development in other industries."

—Dora Mozes
Senior Advisor, Business Analysis
Industry Canada

"Valuable workshop! High potential value! Directly applicable to analyses for understanding the relationship between technology and potential opportunities for our company."

—Mike Ubaldini
Information Associate—Emerging
Technology
Eastman Chemical Co.

"The seminar packs a lot of data into a straight-forward presentation."

Bob Brown
Member, Technical Staff
U S WEST Advanced Technologies

"The information received has allowed me to look at new directions our area may go in the future. New services and products will be coming at such a pace that the challenge will be to come up with a short/long-term forecast that will allow us to make correct decisions in the way our company wants to evolve."

—John Gyryluk
Network Forecast Analyst
TELUS Communications

"Very good! Covered the essential technology forecasting techniques and approaches in a logical sequence. Provided me with a strong technical validation that I could present to management."

—Bernadette Zapiec
Business Research Manager
Rohm & Haas

"Depth and breadth of presenters' experience is evident and significantly enhances value of seminar. Both process and content work well."

—Mary Anne Overman
Manager
Department of Defense

Other TFI Services

Public Courses

Two other courses we offer are *Quantitative Technology Market Forecasting* and *Technology as a Strategic Asset*. Please call or visit our Website for additional information.

In-House Courses

Save time and money! All TFI courses can be tailored to your company's needs and specifications. Subject areas include Technology/Market Forecasting, Technology Advantage Management, Strategic Technology Management, and Distance Education.

Consulting & Research

Since 1978, TFI has provided a wide range of clients with quality Consulting & Research services to support technology-related business decisions. Our C&R activities fall into six general areas: Telecom, Technology Management, Strategic Planning, Forecasting, Strategic Market Research, and Financial Analysis. TFI's knowledge, skill, and experience in these areas enable us to provide you with results that are valid, comprehensive, and easily translated into effective action.

Publications

To provide our clients access to our industry forecasts and analyses, TFI publishes research reports and white papers. We also offer educational publications and monographs on forecasting techniques and methodologies.

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TWO PRACTICAL WORKSHOPS for managers and professionals committed to transforming advances in technology into meaningful business advantage. A discount is available for attendance to both seminars.

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SEPTEMBER 13-15, 1999, Austin, TX

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SEPTEMBER 16-17, 1999, Austin, TX

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TECHNOLOGY FUTURES INC.

Consulting and Research

Since 1978, **Technology Futures, Inc.** (TFI) has been providing clients with quality consulting and research (C&R) services to support technology-related business decisions. The value of these services is reflected by the fact that many of our clients have utilized our services for more than a decade. For us, each C&R project is a special opportunity to provide you with information, analysis, and insights to help you gain significant, sustainable competitive advantage.

TFI's **consulting and research** activities fall into six general areas:

- ◆ TELECOMMUNICATIONS
- ◆ TECHNOLOGY MANAGEMENT
- ◆ STRATEGIC PLANNING
- ◆ FORECASTING
- ◆ STRATEGIC MARKET RESEARCH
- ◆ FINANCIAL ANALYSIS

TFI's knowledge, skill, and experience in these areas enable us to provide you with results that are valid, comprehensive, and easily translated into effective actions.



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TELECOMMUNICATIONS

Turmoil in this arena presents both users and suppliers of telecom services and equipment with unprecedented opportunities, as well as very serious threats. TFI provides information, forecasts, analyses, and strategic insights to support business decisions involving communications technologies and markets including voice, video, and data applications. In terms of talent, experience, and proven track record, TFI is uniquely qualified to assist forward-thinking companies to operate effectively in this rapidly-changing environment.

TFI Telecommunications services can enable you to:

- ◆ Identify, forecast, and evaluate advances in telecom technology and markets.
- ◆ Develop strategic technology, market, and financial plans.
- ◆ Provide outside review of plans and forecasts.
- ◆ Plan and supervise the installation of advanced communications systems.
- ◆ Estimate economic lives and depreciation schedules for telecom investment.
- ◆ Provide expert testimony in regulatory and other proceedings.

TFI Telecommunications is particularly valuable if you are a decision maker responsible for integrating market, financial, and technology factors.

Each year, TFI conducts a number of special research projects and publishes the results. Many of these projects and reports are sponsored by the **Telecommunications Technology Forecasting Group**, which is comprised of major North American local exchange carriers. Recent research projects include subjects such as advanced video services, computer technology, wireless and cable voice services, and the adoption of fiber, HDSL, SONET, and ATM in the local exchange network. TFI also presents the results of our continuing research activities in executive briefings and seminars.

Since 1993, TFI has published **NTQ** (*New Telecom Quarterly*), a journal that presents some of the forefront thinking on developments in the telecom industry and their consequences for the industry and its clients.

Clients include AT&T, GTE, Sprint, MFS, Bell Atlantic, U S WEST, GRC, Pacific Bell, Anchorage Telephone, Ameritech, Cincinnati Bell, Bell Northern Research, Bell Canada, Telepar (Brazil), and Telefonos de Mexico.

TECHNOLOGY MANAGEMENT

Today's rapid rate of advance causes technological factors to play a crucial role in most strategic decisions. To take full advantage of both emerging and existing technologies, a carefully-crafted technology management program is essential to the long-term success—even survival—of any large organization. Since all planning is based on projections of future trends and events, TFI's forecasting proficiency provides us with a unique capability to assist our clients in developing and implementing strong technology management programs.

TFI Technology Management services can help you:

- ◆ Construct technology development roadmaps.
- ◆ Promote technology transfer within and outside the organization.
- ◆ Develop new technology deployment strategies.
- ◆ Allocate R&D resources.
- ◆ Examine the financial implications of technology decisions.
- ◆ Ensure that technology and marketing strategies match.
- ◆ Obtain outside review of plans and forecasts.

Clients include IBM, SEMATECH, Baxter International, MCC, Chevron Chemical, SWB Technology Resources, British Petroleum, duPont, Texaco, and SaskTel.

Strategic Planning

STRATEGIC PLANNING

One of the results of re-engineering and downsizing programs is the realization that, to be successful in today's business environment, companies must be able to employ their resources in the most effective way to achieve both short- and long-term objectives. To accomplish this, you must carefully analyze the business opportunities available to you, select the ones that are most consistent with your capabilities and objectives, determine what additional resources you need, and develop a plan for optimal application of all available resources. This process is commonly called strategic planning, and it has been an area of particular interest to TFI since 1978.

TFI Strategic Planning services can assist you to:

- ◆ Analyze changing technical, market, or social factors to uncover emerging business opportunities.
- ◆ Integrate these opportunities into strategic plans.
- ◆ Identify mismatches between a company's projects, resources, and culture and its strategic goals.
- ◆ Initiate programs to correct these mismatches.
- ◆ Analyze possible and probable competitor strategies and actions.

Since planning is always based on projections about the future, TFI's experience in technology, market, financial, and business environment forecasting provides us with a powerful tool to assist you in strategic planning.

Clients include Arthur Andersen, Ethyl Chemical, McNeil Pharmaceuticals of Canada, the Gas Research Institute, General Motors, AT&T Paradyne, Stentor, FMC, and Kerr-McGee.

Forecasting

FORECASTING

The rapid pace of change in today's business environment magnifies the importance of quality forecasts. To prosper in this environment, you must be able to project future developments in an organized and timely manner. Almost 20 years of forecasting experience has made TFI one of the world's premier practitioners in this field. We actively use more than 20 different techniques that allow us to customize forecasting projects to your specific needs and preferences.

TFI Forecasting services can enable you to:

- ◆ Identify and evaluate new technology-based products and services.
- ◆ Project technology advances.
- ◆ Define market needs for new technologies.
- ◆ Project market adoption rates for new technologies.
- ◆ Formulate strategic models of future developments.
- ◆ Estimate economic lives and depreciation schedules for technology investments.
- ◆ Develop cash flow models for technology investments.

We will work closely with you to integrate your subject matter expertise with our forecasting capability. This ensures the forecast's relevance, validity, and acceptance and provides you and your organization with practical forecasting experience. We can also help you develop your own forecasting program or independently evaluate other forecasts.

Clients include 3M, ALCOA, Frontier, Advanced Micro Devices, BellSouth, Amoco, Bellcore, Weyerhaeuser, Southwestern Bell, and the Aluminum Association.

Strategic Market Research

STRATEGIC MARKET RESEARCH

No element of success in business is more important than the ability to:

- ❖ Identify and assess emerging market opportunities.
- ❖ Determine which opportunities are the most promising for your organization.
- ❖ Determine when and how these opportunities will develop over time.

Strategic market research aims at helping you profit in the long term by taking advantage of fundamental shifts in technologies, markets, and customer needs and desires. We utilize analytical techniques, expert opinion, and customer interviews to provide a rigorous, methods-based vision of future opportunities.

TFI Strategic Market Research services can help you:

- ◆ Identify and evaluate emerging market needs.
- ◆ Assess the potential market for new technologies.
- ◆ Project the rate at which new technologies will be adopted in the marketplace.
- ◆ Assist in developing plans for entering new markets.
- ◆ Assist in planning the entry of existing technologies into new market areas.
- ◆ Ensure that marketing and technology strategies match.

Many of our projects require us to determine *future* customer needs and match them with existing and new technologies. TFI's proven excellence in the area of technology forecasting can provide special insight into such technology/market interrelationships.

Clients include Texas Instruments, Kodak, Johnson & Johnson, Battelle, Corning, Edison Electric Institute, and Kraft Foods.

Financial Analysis

FINANCIAL ANALYSIS

Decisions related to the deployment, acquisition, and management of technology often revolve around financial projections. Unless the payback period is extremely short, these projections will necessarily include explicit or implicit assumptions and forecasts about the future as it relates to costs, prices, demand, market share, industry structure, risk, etc. Thus, such projections boil down to a set of forecasts of technologies, markets, and competition, and their interrelationships. TFI's forecasting experience assures that your financial projections—for both new and existing technology—reflect future realities and opportunities.

TFI Financial Analysis services can assist you to:

- ◆ Develop forecast-based cash flow models for technology decisions.
- ◆ Formulate financially and strategically sound technology replacement strategies.
- ◆ Determine the residual value and economic lives of existing assets.
- ◆ Communicate technology/financial realities to investors, regulators, tax authorities, and other decision makers.

TFI can provide or review key forecasts, assumptions, and inputs for your own financial models, or we can provide you with complete cash-flow models, including probabilistic simulations.

Clients include Arthur Andersen, the Southern Company, Southwestern Bell, and the Telecommunications Technology Forecasting Group.

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